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THE POSSIBILITY OF SECONDARY POISONING FROM THALLIUM USED IN THE CONTROL OF RODENTS *

By F. E. Garlough
Director, Control Methods Research Laboratory, Denver, Colo.,
Division of Predatory Animal and Rodent Control

The possibility of secondary poisoning of birds and mammals through eating carcasses of animals killed by thallium sulphate has been studied for several years at the Control Methods Research Laboratory maintained by the Bureau of Biological Survey at Denver, Colo., in connection with the work of its Division of Predatory Animal and Rodent Control. Thallium sulphate is a poison used under certain conditions for the control of ground squirrels, prairie dogs, rats, and other rodents, and of moles. The birds and mammals studied have been ducks, pigeons, quail, hawks, mice, white rats, wild rats, ground squirrels, prairie dogs, porcupines, and sheep. The results of the laboratory studies and of investigations in the field have thrown some light on the possibility of secondary poisoning.

The weights of the mammals used have run from a few grams up to 49 kilograms (108 pounds), and the results indicate that the minimum lethal dose is almost in direct proportion to the body weight, being about 25 milligrams per kilogram (2.2 pounds) when administered orally. This uniformity indicates that, per kilogram of body weight, the minimum lethal dose of thallium sulphate to man is probably as great.

Deaths of mammals have been recorded from doses smaller than 25 milligrams per kilogram, and survivals have been reported from greater doses, because of individual variations. The cases cited, however, in which the lethal doses have been less, were mostly with thallium as an acetate or a nitrate, both of which compounds are more readily soluble than the sulphate. The present investigations have to do only with the sulphate, as that is the form of thallium used in rodent control. The indications, therefore, are that 25 milligrams per kilogram is correct for mammals, large or small.

In the case of ducks and pigeons or doves, the minimum lethal dose is greater and more variable, ranging from 50 to 100 milligrams per kilogram when administered orally. For a duck weighing 750 grams (the average weight) it has been found that it takes 37.5 milligrams of thallium sulphate to kill (50 milligrams per kilogram).

In accordance with the assumption that 25 milligrams per kilogram is the lethal dose for man, a man weighing 68.2 kilograms (150 pounds) would require in secondary poisoning 1,705 milligrams of thallium sulphate for a fatal dose. Such a man, then,

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would have to eat at one meal at least 45 entire ducks (including viscera) weighing 750 grams each, that had died from thallium poisoning, the elimination of thallium during the period of sickness of the ducks and the excess of lethal dose not being considered. The fact, however, that the viscera retain about one-third of the poison, and would not be eaten, increases the number to 67.5 eviscerated ducks. It has been shown experimentally that ducks may eliminate 50 per cent of thallium sulphate in two days. The number of eviscerated ducks a man would have to eat to obtain a lethal dose would, therefore, be many more than 67.5, the exact number depending upon the degree of elimination (135 in the case of a 50 per cent elimination).

Observations on mammals given different dosages have indicated that one-sixth the fatal dose will produce symptoms whereas one-eighth will not. To experience any symptoms of poisoning, then, a man would have to eat at one meal 16 to 23 eviscerated ducks that had eliminated 50 per cent of the poison.

Assuming that man also would eliminate 50 per cent or more of the poison, and recognizing the cumulative effect of thallium, a man would have to eat two or more ducks a day for 135 days (or considerably longer than the legal duck-shooting season) to experience a lethal dose, and that would mean two or more ducks a day for 16 to 23 days before he would experience even symptoms of poisoning.

It can thus be seen that if ducks, or any of the birds mentioned, should eat grain poisoned with thallium sulphate exposed in ground-squirrel control, and then if these birds later should be eaten by man, the danger from secondary poisoning would be practically nil.